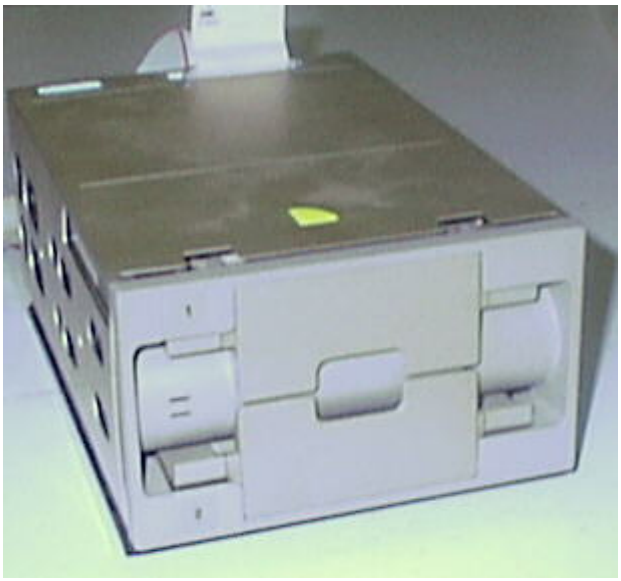
Fork me on GitHub

VAXARCHIVE

(https://github.com/teverett/vaxarchive)

The RX50 FAQ



The RX50 disk drive and its disks are shrouded in a great deal of confusion and mystery. Every few months messages show up in the DEC related news groups concerning this drive that kick off the same discussion again and again. This is because DEC found a very unusual solution for cramming as much data on 5.25 inch disks as cheaply as was possible at the time, so it takes a unusual position in the range of floppy types one is familiar with. The confusion already begins when you mention the word 'floppy' and one listener thinks you mean the disk and another one thinks you mean the drive. I'll try to keep things clear.

This RX50 FAQ answers the following questions:

- Which disk should I use?
- How do I write RX50 disks on a PC?

More questions and answers will follow.

Which disk should I use?

Let's start with comparing the RX50 with other well known 5.25i disk types.

The format used on a RX50 disk is:

- single sided
- 80 tracks
- 10 sectors per track
- 96 tpi (tracks per inch)
- 300 rpm (revolutions per minute)
- 250 KHz data rate

This translates to 400K SSQD, Single Sided Quad Density. In contrast, a standard low density 5.25i PC disk has the format:

- double sided
- 40 tracks on each side
- 9 sectors per track
- 48 tpi
- 300 rpm
- 250 KHz data rate

This translates to 360K DSDD, Double Sided Double Density. To round things off, the format of a standard high density 5.25i PC disk is:

- double sided
- 80 tracks on each side
- 15 sectors per track
- 96 tpi
- 360 rpm
- 500 KHz data rate

which translates to 1.2MB DSHD, Double Sided High Density. Now you can see the source of the confusion:

- The RX50 and the PC 360K disk have the same data rate but a different number of tracks
- The RX50 and the PC 1.2MB disk have the same number of tracks but a different data rate

This means that the disks that the RX50 uses are very much alike PC 360K disks, but very different from PC 1.2MB disks. The magnetic material needed for 48tpi 250KHz (PC 360K) and for 96 tpi 250KHz (RX50) is almost the same, but is very much different from the material needed for 96 tpi 500KHz (PC 1.2MB), because in the latter case in the same amount of time almost twice as much data per track is written per revolution of the disk to be able to cram the almost double amount of sectors in a track.

This also means that while in theory you should use 96 tpi QD disks in a RX50 drive, to allow for the narrower tracks that the RX50 drive writes, the standard PC 360K DD 48 tpi disks will work just fine in a RX50 drive. The quality of a well known brand is good enough to be able to cope with the narrower tracks. Do not use the cheap no-name white label disks. I have used the regular 3M 360K disks in RX50 drives for years, and not a single one has failed yet. You should *never* use 1.2MB HD disks. The magnetic material used in these disks is of a *totally different composition* to allow for the greater number of sectors per track, and it won't work in a RX50 drive, just as it won't work in a PC 360K drive.

How do I write RX50 disks on a PC?

Use a PC with an 1.2MB drive and one of these software packages that can use this drive to write to and read from RX50 disks.

Ah-ha! you say. That won't work! You just told me 1.2MB drives have a different data rate than RX50 drives! Well that is true, and that is not true. I told you things were confusing :) Let me explain.

The PC 1.2MB 5.25i drive is a very interesting critter. When IBM developed the PC AT in 1986, they wanted it to have a disk drive that was able to put much more data on a disk than was possible before, because the customers were complaining a lot about the enormous stack of 360K disks needed to back up their gigantic 20MB hard disks. But IBM also wanted that when a customer bought the PC AT and sold the PC or PC XT he/she was using before, the customer would still be able to read all the disks he/she wrote with the PC XT. So the 1.2MB drive needed to be able to read 360K disks. This was a big mistake and lead to a great amount of confusion, trouble and unreadable disks, but this same mistake makes it possible for us to use the drive with RX50 disks.

You see, IBM designed the 80 track 1.2MB 5.25i drive in such a way that it could switch between two modes. It could do:

- 360 rpm / 500 KHz
- 300 rpm / 250 KHz

The 1.2MB disk is written and read with 360 rpm / 500 KHz, and the 360K disk was supposed to be only read with the 300 rpm / 250 KHz mode. To read the 40 track 360K disks in the 80 track 1.2MB drive, the operating systems stepped the heads two tracks at a time to get the heads to the middle of the next 360K track. The trouble started when the customers started to write to 360K disks with the 1.2MB drives.

The 1.2MB drive is capable of writing 80 tracks in the same space that the 360KB drive can write only 40, and can do this because the head has almost half the width than the head of a 360K drive. This of course also means the written tracks have half the width.

Reading the wide 360K tracks with the narrow 1.2MB head is not a problem, but writing a 360K track with a 1.2MB head guarantees that the wider head of a real 360K drive will not pick up enough signal to read the data reliable. Worse trouble occurs when a disk that was already written to with a 360K drive gets new data written on it with a 1.2MB drive in 360K mode: a narrow new track is written in the middle of the wide old track and while the disk is perfectly readable in a 1.2MB drive, a 360K drive will get the old and the new signals at the same time and won't be able to decode the mess.

But for us the 300 rpm / 250KHz mode of a 1.2MB drive is very fortunate because we need the full 80 tracks of this drive to read and write the RX50 disks, which are 300 rpm / 250KHz and 80 tracks. handy, isn't it?

This also explains why we need special software to use the drive in this mode, because 80 tracks / 300 rpm / 250 KHz / single sided is not a format that is used in a standard PC, although the hardware is capable of it. The only format that comes close is the 720K 3.5i drive, that uses 80 tracks / 300 rpm / 250 KHz / double sided / 9 sectors per track.

Programs to use RX50 disks in a PC

- John Wilson's PUTR (http://www.dbit.com/pub/putr/)
- RainDOS (ftp://ftp.update.uu.se:/pub/rainbow/msdos/latrobe/r/raind111.zip)
- rx50drvr.sys (ftp://www.simtel.net:/pub/simtelnet/msdos/diskutil/rx50.zip)
- Sydex 22disk (http://www.sydex.com/)